

WHAT IS CLAIMED IS:

1. An information processing device for diver adapted to be used for diving with at least first and second cylinders respectively containing first and second mixed gases of a plurality of diving gases, comprising:

a switch timing determination unit configured to determine a switch timing between said first mixed gas to said second mixed gas based on a preset scheduled dive pattern and an actual dive pattern up to present; and

a notification unit configured to provide information for specifying said second mixed gas and said switch timing based on said switch timing.

2. The information processing device according to claim 1, further comprising:
a mixture ratio input unit configured to receive a user input for a ratio of said diving gases in each of said first and second mixed gases;

an input range storage unit configured to store in advance a permissible input range of said ratio for each of said diving gases; and

an input value correction unit configured to correct said mixture ratio within said input range for each of the diving gases when said ratio input by a user is outside of said input range for each of the diving gases.

3. The information processing device according to claim 1, further comprising
said mixture ratio input unit is configured to receive a user input for a ratio of oxygen as a diving gas, and

an oxygen standard ratio calculation unit configured to calculate said ratio of diving gases other than oxygen based on said ratio of oxygen input by the user or said ratio of oxygen that has been corrected after being input by the user.

4. The information processing device according to claim 3, wherein
said mixture ratio input unit is configured to receive a user input for a ratio of helium and a ratio of nitrogen as diving gases, and

said oxygen standard ratio calculation unit is configured to calculate said ratio of nitrogen based on said ratio of helium and said ratio of oxygen.

5. The information processing device according to claim 4, wherein
said oxygen standard ratio calculation unit is configured to correct said ratio of helium
without modifying said ratio of oxygen, and to set said ratio of oxygen and said ratio of
helium to 100% when said ratio of oxygen and said ratio of helium exceed 100%.

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6. The information processing device according to claim 1, further comprising
a mixture ratio input unit configured to receive a user input for said ratio of the
plurality of diving gases in said first and second mixed gases,
a priority level storage unit configured to store a priority level for each of the diving
gases, and

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a low priority level input value correction unit configured to give precedence to said
ratio for a high-priority diving gas with a higher priority and correct said ratio for a low-
priority diving gas with a lower priority based on the stored priority levels.

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7. The information processing device according to claim 6, further comprising
an input range storage unit configured to store in advance a permissible input range of
said ratio for each of said diving gases, and

an input range correction unit configured to correct said input range of said ratio
corresponding to said low-priority diving gas based on the stored input range and a user input
value of said ratio for said high-priority diving gas.

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8. The information processing device according to claim 1, further comprising
a condition presentation unit configured to present information for setting at least one
switching condition for each of said first and second cylinders,

a selection operation unit configured to receive a user input for setting said at least one
switching condition for said first and second cylinders, and

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a switching condition storage unit configured to store said at least one switching
condition selected by a user for each of said first and second cylinders.

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9. The information processing device according to claim 8, wherein
said at least one switching condition includes a dive time, an amount of oxygen in a
diver's body, an amount of inert gas in a diver's body, an available dive time or water depth.

10. The information processing device according to claim 9, wherein
said switching condition storage unit is configured to store at least one of or a
combination of said dive time, said amount of oxygen in the diver's body, said amount of
inert gas in the diver's body, said available dive time and said water depth for each of said
5 first and second cylinders.

11. A method for controlling an information processing device for diver adapted to
be used for diving with at least first and second cylinders respectively containing first and
second mixed gases of a plurality of diving gases, comprising:

10 performing a switch timing determination step for determining a switch timing
between said first mixed gas to said second mixed gas based on a preset scheduled dive
pattern and an actual dive pattern up to present; and
performing a notification step for providing information for specifying said second
mixed gas and said switch timing based on said switch timing.

12. The method for controlling the information processing device according to
claim 11, further comprising:

performing an input range storage step for storing in advance a permissible input
range of said ratio for each of said diving gases;

20 performing a mixture ratio input step for receiving a user input for a ratio of said
diving gases in each of said first and second mixed gases; and

performing an input value correction step for correcting said mixture ratio within said
input range for each diving gas when said ratio input by a user is outside of said input range
for each diving gas.

13. The method for controlling the information processing device according to
claim 11, further comprising

said mixture ratio input step includes receiving a user input for a ratio of oxygen as a
diving gas, and

30 performing an oxygen standard ratio calculation step for calculating said ratio of
diving gases other than oxygen based on said ratio of oxygen input by the user or said ratio of
oxygen that has been corrected after being input by the user.

14. The method for controlling the information processing device according to claim 11, further comprising

performing a mixture ratio input step for receiving a user input for said ratio of the plurality of diving gases in said first and second mixed gases,

5 performing a priority level storage step for storing a priority level for each of the diving gases; and

performing a low priority level input value correction step for giving precedence to said ratio for a high-priority diving gas with a higher priority and correcting said ratio for a low-priority diving gas with a lower priority based on the stored priority levels.

10 15. The method for controlling the information processing device according to claim 14, further comprising

performing an input range storage step for storing in advance a permissible input range of said ratio for each of said diving gases, and

15 performing an input range correction step for correcting said input range of said ratio corresponding to said low-priority diving gas based on the stored input range and a user input value of said ratio for said high-priority diving gas.

20 16. The method for controlling the information processing device according to claim 11, further comprising

performing a condition presentation step for presenting information for setting at least one switching condition for each of said first and second cylinders,

performing a selection control step for receiving a user input for setting said at least one switching condition for said first and second cylinders, and

25 performing a switching condition storage step for storing said at least one switching condition selected by a user for each of said first and second cylinders.

17. The method for controlling the information processing device according to claim 16, wherein

30 said at least one switching condition includes a dive time, an amount of oxygen in a diver's body, an amount of inert gas in a diver's body, an available dive time or water depth.

18. The method for controlling the information processing device according to claim 17, wherein

said switching condition storage unit is configured to store at least one of or a combination of said dive time, said amount of oxygen in the diver's body, said amount of inert gas in the diver's body, said available dive time and said water depth for each of said first and second cylinders.

19. A control program for allowing a computer to function as an information processing device for diver adapted to be used for diving with at least first and second cylinders respectively containing first and second mixed gases of a plurality of diving gases, comprising instructions for performing:

determining a switch timing between said first mixed gas to said second mixed gas based on a preset scheduled dive pattern and an actual dive pattern up to present; and

issuing a notification regarding said information for specifying said second mixed gas based on said switch timing and a notification regarding said switch timing based on said switch timing.

20. The control program according to claim 19, further comprising instructions for performing

receiving a user input for said ratio of the diving gases in said first and second mixed gases, and

correcting said mixture ratio within a pre-stored permissible input range for each of the diving gases when said ratio input by a user is outside of said input range for each of the diving gases.

21. The control program according to claim 19, further comprising instructions for performing

receiving a user input for a ratio of oxygen as a diving gas, and

calculating said ratio of diving gases other than oxygen based on said ratio of oxygen input by the user or said ratio of oxygen that has been corrected after being input by the user.

22. The control program according to claim 21, further comprising instructions for performing

receiving a user input for a ratio of helium and a ratio of nitrogen as diving gases, and calculating said ratio of nitrogen based on said ratio of helium and said ratio of

5 oxygen.

23. The control program according to claim 22, further comprising an instruction for performing

correcting said ratio of helium without modifying said ratio of oxygen, and to set said
10 ratio of oxygen and said ratio of helium to 100% when said ratio of oxygen and said ratio of helium exceed 100%.

24. The control program according to claim 19, further comprising instructions for performing

15 receiving a user input for said ratio of the plurality of diving gases in said first and second mixed gases,

storing a priority level for each of the diving gases, and

giving precedence to said ratio for a high-priority diving gas with a higher priority and correcting said ratio for a low-priority diving gas with a lower priority based on the stored
20 priority levels.

25. The control program according to claim 24, further comprising instructions for performing

25 storing in advance a permissible input range of said ratio for each of said diving gases, and

correcting said input range of said ratio corresponding to said low-priority diving gas based on the stored input range and a user input value of said ratio for said high-priority diving gas.

30 26. The control program according to claim 19, further comprising instructions for performing

presenting information for setting at least one switching condition for each of said first and second cylinders,

receiving a user input for setting said at least one switching condition for said first and second cylinders, and

storing said at least one switching condition selected by a user for each of said first and second cylinders.

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27. The control program according to claim 26, wherein

said at least one switching condition includes a dive time, an amount of oxygen in a diver's body, an amount of inert gas in a diver's body, an available dive time or water depth.

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28. The control program according to claim 27, further comprising a instruction for performing

storing at least one of or a combination of said dive time, said amount of oxygen in the diver's body, said amount of inert gas in the diver's body, said available dive time and said water depth for each of said first and second cylinders in performing said storing said at least one switching condition selected by the user.

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29. A computer readable recording medium having a control program for allowing a computer to function as an information processing device for diver adapted to be used for diving with at least first and second cylinders respectively containing first and second mixed gases of a plurality of diving gases, comprising instructions for performing:

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determining a switch timing between said first mixed gas to said second mixed gas based on a preset scheduled dive pattern and an actual dive pattern up to present; and

issuing a notification regarding said information for specifying said second mixed gas based on said switch timing and a notification regarding said switch timing based on said switch timing.

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30. An information processing device for a diver adapted to be used for diving with at least first and second cylinders respectively containing first and second mixed gases in which a plurality of diving gases are mixed with different mixture ratios for each of said first and second cylinders, comprising:

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an oxygen partial pressure calculating and monitoring unit configured to prohibit switching from said first cylinder to said second cylinder when the diver selects to use said

second cylinder while using said first cylinder upon a determination of a possibility of oxygen deficiency or oxygen poisoning if said second cylinder is used.

31. The information processing device according to claim 30, wherein
5 at least one of said first and second cylinders contains oxygen as one of the diving gases.

32. The information processing device according to claim 30, wherein
said oxygen partial pressure calculating and monitoring unit includes
10 an oxygen partial pressure violation determining unit configured to calculate an oxygen partial pressure and determine whether there is the possibility of oxygen poisoning or oxygen deficiency, and
a notification unit configured to notify the diver when there is the possibility of oxygen poisoning or oxygen deficiency.

33. The information processing device according to claim 30, wherein
said oxygen partial pressure calculating and monitoring unit is configured to execute a process that permit switching from said first cylinder to said second cylinder, when the diver
selects to use said second cylinder while using said first tank, and upon a determination of no
20 possibility of oxygen deficiency or oxygen poisoning based on an oxygen partial pressure value if said second cylinder is used.

34. The information processing device according to claim 32, wherein
said notification unit is configured to notify the diver whether switching to said
25 second cylinder is permitted by using at least one of display, alarm sound, or EL backlight.

35. The information processing device according to claim 30, further comprising:
a time keeping section configured to measure an elapsed dive time;
a water depth gauging section configured to detect a water depth value at a diving
30 location of the diver in accordance with a preset elapsed dive time; and
a diving information storage unit configured to store said elapsed dive time and said detected water depth value.

36. An information processing device for a diver adapted to be used for diving with at least first and second cylinders respectively containing first and second mixed gases in which a plurality of diving gases are mixed with different mixture ratios for each of said first and second cylinders, comprising:

5 a switching condition storage unit configured to store at least one switching condition during diving for each of said first and second cylinders;

a switch destination cylinder selecting unit configured to receive a user input for switching from said first cylinder to said second cylinder while the diver is using said first cylinder;

10 a safety determining unit configured to determine whether there is a possibility of oxygen poisoning or oxygen deficiency if said second cylinder is used; and

a warning unit configured to warn the diver when the possibility of oxygen poisoning or oxygen deficiency has been determined.

15 37. The information processing device according to claim 36, further comprising a cylinder information presentation unit configured to present to the diver information about said second cylinder when the diver has selected to switch to said second cylinder.

20 38. The information processing device according to claim 37, wherein said information about said second cylinder includes a mixture ratio of the diving gases in said second cylinder and a diving condition information in a situation when said second cylinder is used.

25 39. The information processing device according to claim 38, wherein said diving condition information includes a permissible non-decompression dive time or decompression diving instruction, and oxygen partial pressure.

30 40. A control method for an information processing device for a diver adapted to be used for diving with at least first and second cylinders respectively containing first and second mixed gases in which a plurality of diving gases are mixed with different mixture ratios for each of said first and second cylinders, comprising:

performing an oxygen partial pressure calculating and monitoring step for calculating and monitoring oxygen partial pressure; and

performing a switch prohibiting step for prohibiting switching from said first cylinder to said second cylinder when the diver selects to use said second cylinder while using said first cylinder upon a determination of a possibility of oxygen deficiency or oxygen poisoning if said second cylinder is used.

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41. The control method for the information processing device according to claim 40, further comprising

said oxygen partial pressure calculating and monitoring step includes

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performing an oxygen partial pressure violation determining step for determining whether there is the possibility of oxygen poisoning or oxygen deficiency, and performing a notification step for notifying the diver when there is the possibility of oxygen poisoning or oxygen deficiency.

42. The control method for the information processing device according to claim 40, wherein

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the switch prohibiting step includes permitting switching from said first cylinder to said second cylinder, when the diver selects to use said second cylinder while using said first tank, and upon a determination of no possibility of oxygen deficiency or oxygen poisoning based on an oxygen partial pressure value if said second cylinder is used.

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43. The control method for the information processing device according to claim 41, wherein

said notification step includes notifying the diver whether switching to said second cylinder is permitted by using at least one of display, alarm sound, or EL backlight.

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44. The control method for the information processing device according to claim 40, further comprising

performing a time keeping step for measuring an elapsed dive time,

performing a water depth gauging step for detecting a water depth value at a diving

30 location of the diver in accordance with a preset elapsed dive time, and

performing a diving information storing step for storing said elapsed dive time and said detected water depth value.

45. A control method for an information processing device for a diver adapted to be used for diving with at least first and second cylinders respectively containing first and second mixed gases in which a plurality of diving gases are mixed with different mixture ratios for each of said first and second cylinders, comprising:

5 performing a switching condition storing step for storing at least one switching condition during diving for each of said first and second cylinders;

performing a switch destination cylinder selecting step for receiving a user input for switching from said first cylinder to said second cylinder while the diver is using said first cylinder;

10 performing a safety determining step for determining whether there is a possibility of oxygen poisoning or oxygen deficiency if said second cylinder is used; and

performing a warning step for warning the diver when the possibility of oxygen poisoning or oxygen deficiency has been determined.

15 46. The control method for the information processing device according to claim 45, further comprising

performing a cylinder information presentation step for presenting to the diver information about said second cylinder when the diver has selected to switch to said second cylinder.

20 47. The control method for the information processing device according to claim 46, wherein

said information about said second cylinder includes a mixture ratio of the diving gases in said second cylinder and a diving condition information in a situation when said
25 second cylinder is used.

48. The information processing device according to claim 47, wherein
said diving condition information includes a permissible non-decompression dive time or decompression diving instruction, and oxygen partial pressure.

30 49. A control program for controlling with a computer an information processing device for a diver adapted to be used for diving with at least first and second cylinders respectively containing first and second mixed gases in which a plurality of diving gases are

mixed with different mixture ratios for each of said first and second cylinders, comprising instructions for performing:

calculating and monitoring oxygen partial pressure;

determining a possibility of oxygen deficiency or oxygen poisoning if said second

5 cylinder is used when the diver selects to switch to said second cylinder while using said first cylinder; and

prohibiting switching from said first cylinder to said second cylinder upon a determination of the possibility of oxygen deficiency or oxygen poisoning.

10 50. The control program according to claim 49, further comprising instructions for performing

determining whether there is the possibility of oxygen poisoning or oxygen deficiency based on the oxygen partial pressure; and

15 notifying the diver when there is the possibility of oxygen poisoning or oxygen deficiency.

51. The control program according to claims 49 or 50, wherein

20 said oxygen partial pressure calculating and monitoring unit permits switching from said first cylinder to said second cylinder, when the diver selects to use said second cylinder while using said first tank, and upon a determination of no possibility of oxygen deficiency or oxygen poisoning based on an oxygen partial pressure value if said second cylinder is used.

52. The control program according to claim 51, further comprising a instruction for performing

25 notifying the diver whether switching to said second cylinder is permitted by using at least one of display, alarm sound, or EL backlight.

53. The control program according to claim 49, further comprising instructions for performing

30 measuring an elapsed dive time,

detecting a water depth value at a diving location of the diver in accordance with a preset elapsed dive time, and

storing said elapsed dive time and said detected depth value.

54. A control program for controlling with a computer An information processing device for a diver adapted to be used for diving with at least first and second cylinders respectively containing first and second mixed gases in which a plurality of diving gases are mixed with different mixture ratios for each of said first and second cylinders, comprising instructions for performing:

storing at least one switching condition during diving for each of said first and second cylinders;

receiving a user input for switching from said first cylinder to said second cylinder while the diver is using said first cylinder;

determining whether there is a possibility of oxygen poisoning or oxygen deficiency if said second cylinder is used; and

warning the diver when the possibility of oxygen poisoning or oxygen deficiency has been determined.

55. The control program according to claim 54, further comprising a instruction for performing

presenting to the diver information about said second cylinder when the diver has selected to switch to said second cylinder.

56. The control program according to claim 55, wherein said information about said second cylinder includes a mixture ratio of the diving gases in said second cylinder and a diving condition information in a situation when said second cylinder is used.

57. The control program according to claim 56, wherein said diving condition information includes a permissible non-decompression dive time or decompression diving instruction, and oxygen partial pressure.

58. A computer readable recording medium for storing a control program for controlling with a computer an information processing device for a diver adapted to be used for diving with at least first and second cylinders respectively containing first and second

mixed gases in which a plurality of diving gases are mixed with different mixture ratios for each of said first and second cylinders, comprising instructions for performing:

calculating and monitoring oxygen partial pressure;

determining a possibility of oxygen deficiency or oxygen poisoning if said second

5 cylinder is used when the diver selects to switch to said second cylinder while using said first cylinder; and

prohibiting switching from said first cylinder to said second cylinder upon a determination of the possibility of oxygen deficiency or oxygen poisoning.

10 59. A diving equipment, comprising:

first and second cylinders respectively filled with first and second mixed gases in which a plurality of diving gases are mixed with different mix ratios for each of said first and second mixed gases;

15 a switching device coupled to said first and second cylinders configured to switch between said first and second cylinders to selectively supply a diver with one of said first and second mixed gases; and

a regulator configured to supply the driver with said one of said first and second mixed gases supplied via said switching device at a specific pressure.

20 60. The diving equipment according to claim 59, wherein

said mixture ratio of one of said first and second cylinders is set based on a water depth range during diving; and

said mixture ratio of the other one of said first and second cylinders is set for decompression diving.

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61. The diving equipment according to claim 59, wherein

said first and second mixed gases in said first and second cylinders, respectively, are obtained by mixing at least two of three or more predetermined diving gases.

30 62. The diving equipment according to claim 61, wherein

said diving gases include oxygen, nitrogen, and helium.

63. The diving equipment according to claim 59, wherein
said first and second mixed gases are obtained by mixing oxygen and at least one inert
gas.

5 64. The diving equipment according to claim 63, wherein
said at least one inert gas includes at least one of helium, neon, argon, krypton, or
xenon.

10 65. The diving equipment according to claim 59, wherein
said diving gases include at least hydrogen.

15 66. The diving equipment according to claim 59, further comprising
an information processing device configured to output switching instructions to said
switching device and instructions of a subsequent diving pattern based on a preset scheduled
dive pattern and an actual dive pattern up to present.

20 67. A control method of a diving equipment comprising a plurality of cylinders
filled with mixed gases of a plurality of diving gases, a switching device coupled to said
plurality of cylinders that executes a switching between said cylinders to selectively supply a
mixed gas contained in one of said cylinders, and a regulator that supplies said mixed gas
supplied via said switching device with a prescribed pressure, comprising:

performing a storage step for storing a preset scheduled dive pattern and an actual dive
pattern up to present;

25 performing a switching instruction step for instructing switching to said switching
device based on said preset scheduled dive pattern and said actual dive pattern up to present;
and

performing a diving pattern instruction step for instructing a subsequent diving pattern.